

Economic dependence of rural people on homestead forestry in Mymensingh, Bangladesh

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Abstract: Homestead forests contribute substantially to the rural economy of Bangladesh. Rural people depend on trees and plants for their energy usage, housing, food and other forms of subsistence livelihood. In order to identify the potential role of forests on homestead dwellers, an empirical field investigation was conducted in the four Upazilas of Mymensingh district of Bangladesh. It was found that land holdings of the respondents within the four sites are the highest in Mymensingh. The study made an important observation that among all homestead vegetation between 5–6 years old, tree species are generally preferred over plants. This is perhaps due to the efforts of the social forestry extension service to demonstrate that planting trees is an important long-term investment. In all four Upazilas, there was a significant correlation between household annual income and homestead forestry, agriculture and fisheries practice, suggesting that higher income families tend to have larger holdings of homesteads, farms and pond areas. Three Upazilas displayed a strong positive relationship (nearly 45%) between homestead forest areas and annual family income; however, the Fulbaria Upazila showed a very poor relationship (0.2%) in this regard. The results of this study

suggest that homestead forests play a positive role in the rural economy, in addition to helping mitigate the increasing problem of deforestation in Bangladesh.

Keywords: economic dependence, homestead, Bangladesh, forestry


Introduction

Bangladesh, being a sub-tropical country, enjoys a wide range of bio-diversity on both wild and cultivated lands. Of the total area of Bangladesh (147,570 km²), the majority (64.2%) is agricultural lands, whereas forest lands and urban areas account for 17.8% and 8.3%, respectively. Water and other land uses make up the remaining 9.9% (GOB 1995). Homesteads are privately owned dwellings in the rural and semi-urban settings that typically consist of a living area, kitchen, backyard, front yard, and sometimes a pond and patio. Homestead forestry is an age-old agroforestry practice where vegetables, horticultural, tree species and other crops are grown intensively in and around the dwelling premises simultaneously and/or sequentially. Rural people mostly depend on trees and plants for their energy usage, housing, food and other forms of subsistence livelihood. Homesteads have very rich and diverse plant stocks, and play a major role in timber and fuel-wood supply, especially in Bangladesh. Homestead forests as a traditional multilayered agroforestry practice occupy an area of 2,951.40 km² (2% of the land area), spreading over more than 20 million homesteads in Bangladesh (Salam et al. 2000). Among the forest areas privately owned, homestead forests occupy 11.5% of the area, while the government forests occupy the remaining 86.3% (GOB, 1995).

Homestead forests around the world often exhibit remarkable variation in composition and structure. These are influenced by the physiographic and climatic conditions of the area, and a wide variety of other characteristics. A homestead forest, or “home-garden”, is a mixture of deliberately planted vegetation, usually with a complex structure, and designed to produce natural products for the households or market sale (Vogl and Vogl-Lukasser,

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2003; Kabir and Webb 2008a, b; Kabir and Webb, 2009). Through the production of a variety of sustainable products and services, homestead forests also help to reduce pressure on the designated natural forests and protected areas.

Bangladesh, being a small country, never had extensive forest resources. Per capita forestland in Bangladesh is 0.022 ha, the lowest in the world. Continued denudation of the forests has led to the forests being almost entirely barren of trees, and mostly covered by grass, scrub or bush. Although the forested area technically covers 17.8% of Bangladesh, the actual forest cover does not exceed 6% [Forestry Master Plan (FMP), 1993]. This deterioration of vegetation cover is due to increasing population pressure, high demand for forest products, lack of public awareness, conversion of forestland to other land uses and inadequate manpower of the Forest Department (FD). Homesteads in Bangladesh are quite abundant with a variety of trees, shrubs, herbs, and aerial plants. Production of small poultry and livestock, and even small-scale fish cultivation are common practice in homesteads. These practices are prevalent not only in Bangladesh but also in many south and south-east Asian, Latin American and African countries. This homestead based plant production system is termed differently as ‘home garden’ and ‘backyard agro-forest garden’ in the Philippines, ‘village -forest gardens’ (Michon, 1983) in Java and ‘mixed garden’ in Central America. In Bangladesh, the term ‘homestead forest’ or ‘tree cover’ is generally used.

Homestead forests can be managed for commercial or subsistence purposes, and can provide from only a few to more than 100 products. A wide variety of factors may be associated with homestead forest diversity and structure, including biophysical features (Soemarwoto, 1987; Kumar et al. 1994; Hocking et al. 1996; Trinh et al. 2003; Ali, 2005). The economic attributes and requirements (e.g. subsistence or commercial orientation of the farmers) have been well documented by Michon and Mary (1994), Trinh et al. (2003), Ali (2005) and Abdoellah et al. (2006). The social responses to homestead forestry (e.g., tradition, culture, ethnicity, previous experience, education) are well illustrated by Millat-e-Mustafa et al. (2000), Trinh et al. (2003) and Simons and Leakey (2004). Understanding the forces influencing farmers’ decisions on home-garden investment is important not only for exploring the human environment linkage, but also to potentially improve livelihoods through more effective management strategies.

This study was conducted in the Mymensingh district of Bangladesh. The main focuses of this study were to: (1) identify the homestead sizes, household members and other demographic characteristics of the study area, (2) characterize trends of tree planting and growth in homesteads, (3) investigate the role of homestead forests in the household economy of Bangladesh, and (4) assess the attitude of homestead forest owners towards homestead forestry in Bangladesh. It is hypothesized that (1) trees with economic importance are the preferred choice of the people, and (2) there is a positive correlation between homestead forests and household income. Our research question asked whether the homestead forests of this region are rich in species of economic importance, and whether these contribute significantly to their

proprietors. The people’s attitude towards forestry practice was also evaluated. In answering these research questions, this paper aims to provide a valuable database of information on homestead forests in this region, including their financial contributions to the local communities, with the intent to positively impact and ultimately improve the existing policies pertaining to homestead forests.

Methodology

This paper presents and discusses data from homestead forests in four Upazilas of the Mymensingh district in Bangladesh. These are the Mymensingh Sadar, Muktagacha, Fulbaria and Bhaluka Upazilas (Fig. 1). We collected the data on species composition, number of trees in homesteads, tree growing trends in homesteads and economic gain.

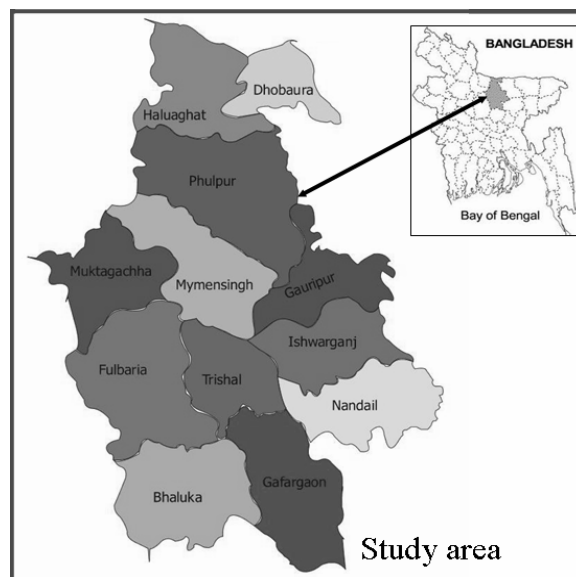


Fig. 1 Map of Bangladesh showing the study area

Sampling procedure

We selected Mymensingh for this study which is among the 64 districts in Bangladesh. In Mymensingh, there are 12 Upazilas which contain 2,700 villages. We selected randomly four Upazilas, containing a total of 704 villages. Among the 704 villages, 12 villages were selected randomly for the study. Using stratified random sampling, we selected 120 of the total 1,226 households in 12 villages for a semi-structured questionnaire survey. The tools used for gathering information were as follows:

(1) Semi-structured questionnaire survey – A preliminary questionnaire was given to randomly selected respondents in the study villages. The respondents were asked further questions based on their responses.

(2) Focus Group Discussion – Focus group discussions were arranged in common places where local people usually gather to pass time and socialize. This approach helped to avoid personal

opinions and assess the common collective perspective. Twelve such discussions in 12 villages were held during the survey.

(3) A qualitative evaluation of the respondent's individual responses was completed in order to gather people's opinions on certain attributes of homestead forestry and their contributions. This evaluation helped to better understand the level of people's awareness of homestead forestry practices and their importance. The respondents were asked to express their magnitude of acceptance of homestead forestry in Bangladesh using a scale of 0–5, with 0 indicating no, 1 as minute, 2 as slight, 3 as moderate, 4 as high and 5 as extremely high.

Statistical analysis

Land holding and annual family income data were analyzed statistically for their average value, standard deviation and standard error of mean. Correlation and multiple regression analysis were conducted to examine the relationship between yearly family income and three potential variables (homestead forest, agriculture and fisheries). A multiple regression standardized prediction model was used:

$$y = b_1x_1 + b_2x_2 + b_3x_3 + \dots + b_nx_n \quad (1)$$

In this model, y is the predicted value of the criterion variable (dependent variable, family income), x represents the independent (explanatory) variables, and b represents the predicted coefficient of the independent variables. Data analysis was carried out using Microsoft Excel and PASW (Predictive Analytic Software).

Results

Basic demographic and socio-economic features of the study area

The average number of family members was 5 (when rounded off), with a standard deviation of 1.237. The actual number ranged from 2 to 11, and was equally divided among male and female members (Table 1).

The landholding per household varied widely. The majority of land was used for housing purposes (18.40±12.73 decimal). Homestead forest areas were the second most common type ranging from 0 to 40 decimal (13.20±17.01 decimal), followed by pond area (8.10±3.48 decimal) and other land uses (2.5±7.91 decimal). Housing area, homestead forest area and other land use areas varied widely between households; however, pond area was more consistent. Average annual family income and expenditure was 122,083.33±123481 Tk (used for Taka - the Bangladesh currency, with a conversion ratio with the US currency as 1 US\$ = 69.00 Bangladeshi Taka) and 99,716.88±118,750 Tk, ranging from 25,000 Tk to 700,000 Tk and 27,000Tk to 700,000 Tk, respectively. In Mymensingh Sadar and Muktagacha, the average number of family members was 6; whereas in Fulbaria and Bhaluka, the average was 5 (Table 2). Every family had a minimum of two earning members on average. The average in-

come of the surveyed families in Mymensingh, Muktagacha, Fulbaria and Bhaluka were 195,900 Tk, 110,400 Tk, 98,166 Tk and 93466 Tk, respectively. These numbers suggest that the rural households of Mymensingh Sadar have a moderate annual income, the households of Muktagacha and Bhaluka have a very marginal income, and the households of Fulbaria live with a negative annual income balance.

Table 1. Basic demographic and socio-economic attributes of the households in the study areas

Variables	Mean	Maxi- mum	Mini- mum	Standard deviation	Standard error of mean
Family member	5	11	2	1.237	0.113
Land holdings (decimal)					
Homestead size	39.3	70	10	16.45	1.42
Housing area	18.4	30	9	12.73	1.81
Pond area	8.1	10	0	3.48	0.13
Kitchen garden and other plants	13.2	40	0	17.01	1.63
Area for other use	2.5	20	1	7.91	0.24
Family income and expenditure in Tk*.					
Annual family income	122083.33	700000	25000	123481	11272.19
Annual family expenditure	99716.88	700000	27000	118750	10840.33

Here, valid data is for 120 families and missing data is 0 for all the variables.

* 1 US \$= 69 Bangladeshi Taka (Tk.)- the Bangladeshi currency

Source: Field survey

Table 2. Site specific demographic and socio-economic information

Study sites	Mean family size	Mean earning member. HHs ⁻¹	Mean HHs income. annum ⁻¹ (tk)	Mean HHs expenditure. annum ⁻¹ (tk)	Mean land holdings. HHs ⁻¹ (decimal)
Mymensingh Sadar	6	2	195900	155550	125
Muktagacha	6	2	110400	96400	93
Fulbaria	5	2	98166	116970	75
Bhaluka	5	2	93466	81800	84

Source: Field survey

Moreover, the households of Fulbaria hold less land as well, compared to the other Upazila's families surveyed. It is possible that they depend on available rural credits with high interest rates or on credits offered by NGOs. Another possibility is that the respondents might not have given their truthful annual income, which is a common occurrence in interviews regarding individuals' income statements. The average area of land holding is high in the families of Mymensingh Sadar. The garden and other planted areas, e.g. the homestead forest area, is the second largest land use of the homestead owners, which is preceded only by housing area.

Land holding for the homestead forests

We used five household/farm categories to evaluate the socio-economic condition and homestead forest status in terms of land

holding for homestead forestry practice (Fig. 2). These are none (no land holding for homestead forest), very poor (0–10 decimal), poor (11–25 decimal), medium (26–50 decimal) and rich (above 50) (adopted after Khan et al. (2007)).

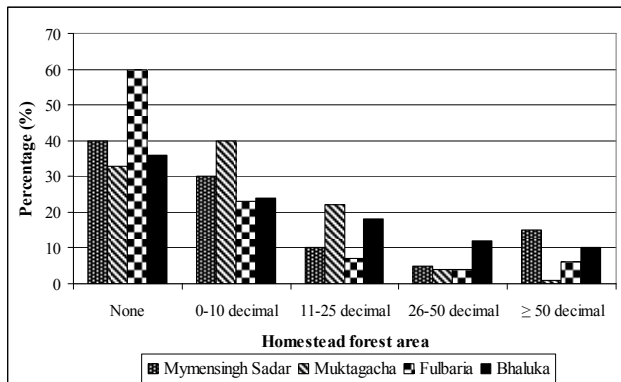


Fig. 2 Land holding per family for homestead forestry

A huge proportion (60%) of people living in Fulbaria have no land of their own for forestry practice solely, while in the other three Upazilas landless people constitute about 35% to 40% of the total people. Those people who are landless (in terms of homestead forest ownership) in Mymensingh Sadar, are assumed to be living in the town. But to have no homestead forest land in the other three Upazilas turns out to be quite contrary to our basic understanding of homesteads, corresponding with their penury or severe poverty. Forty percent of the people of Muktagacha have 0–10 decimal of land for forestry purposes, and almost 25% of the people have 11–20 decimal land. This is the highest on average among the four Upazilas, but there are no people in Muktagacha who have >50 decimal of land, whereas 15% of the people in Mymensingh Sadar have >50 decimal of land. These numbers suggest that the people of Muktagacha have a high middle class demographic in terms of land use and ownership.

Relationship of family income with homestead forestry, agriculture and fisheries practice

For homestead forestry, agriculture and fisheries, we looked at homestead forest area, farm land and pond area, respectively. All three variables were found to be positively and significantly correlated with the criterion variable (yearly income), indicating that higher holdings of homestead, farm and pond areas tend to correlate with higher family income. However, the multiple regression model with these three variables produced $R^2 = 0.49$, i.e. the model accounts for just less than 50% of the variance. Homestead area and pond area had significant ($p < .05$) positive regressions (Table 3) indicating that greater holdings of homestead and pond areas are expected to be associated with higher family income of the respondent, after controlling the other variables in the model. Again, farm land had a negative weight in the multiple regression model, indicating that after accounting for homestead and pond area, people with greater farm land areas were

expected to have lower annual family incomes.

Table 3. Correlation and regression analysis of different variable with yearly family income in the study areas

Variable	Correlation with yearly income	Multiple regression weights		
		Standardized Coefficient (b)	t	Sig.
Homestead area	0.471**	0.348	3.394	0.001**
Pond area	0.445**	0.301	2.886	0.005**
Farm land	0.353**	-0.031	-.273	0.785

** indicates significant at $p \leq .01$ le

Dependence on homestead forests

As our primary objective was to determine the extent of the respondents' economic dependence on homestead forest, we used a linear regression model to evaluate the relationship between homestead forest area and yearly family income (Fig. 3). A moderate positive correlation was observed between homestead forest area and yearly family income for Mymensingh Sadar ($r = 0.698$), Muktagacha ($r = 0.659$) and Bhaluka ($r = 0.676$), and a low negative correlation ($r = -0.045$) was found for Fulbaria. The variability of the dependent variable in response to the independent variables was best estimated by the regression model R^2 (Rugalema et al. 1994; Salam et al. 2000; Coomes and Ban, 2004). The R^2 values for the regression of homestead forest area with annual family income were moderate for Mymensingh Sadar ($R^2 = 0.49$), Muktagacha ($R^2 = 0.43$) and Bhaluka ($R^2 = 0.46$), and low ($R^2 = 0.002$) for Fulbaria. In the three Upazilas where a more or less reasonable correlation was found, it is deemed that those who have area for homestead forestry practice are experiencing positive benefits from the homestead forest. Similar findings were also observed for home gardens in Java and Kerala (Krishnakutty, 1990; Christanty, 1985). It could be argued that this relationship is coincidental and homestead forest area has nothing to do with the yearly family income. However, considering the issue as a whole (including all other types of analysis), this proposal is quite pragmatic.

The low R^2 value of Fulbaria implies that homestead forest area was not a strong predictor of yearly family income. A possible explanation for this low correlation may be that not all relevant variables were considered and homestead forest systems in the study area may reflect non-linear relationships between household income and home garden area. None of these possibilities could be assessed using our statistical tests. In addition, it is found that the average land holding size of the people of Fulbaria was very low. Sixty percent of the respondents don't even have any land for homestead forest. These landless people need to support their livelihood by other means. As they are still earning incomes, but from sources other than the homestead forest areas, the relationship tends to be close to zero.

If we take the aforementioned relationship to be true, we can conclude that homestead forestry can endow significant benefits if it is practiced in accordance with proper scientific methods. It was observed that rural homestead dwellers have well estab-

lished local crop cultivation practices because they possess a history of indigenous knowledge. However, there is still a need for further scientific research and development of appropriate homestead forest models to help improve economic return from intensive cultivation. Under the negative scenario of forest man-

agement in Bangladesh, scientific homestead forestry practice has a good chance of reducing the pressure and stress on the State forests within the country. Nevertheless, it is opined from this regression analysis, that there is still scope to improve this practice from an economic efficiency perspective.

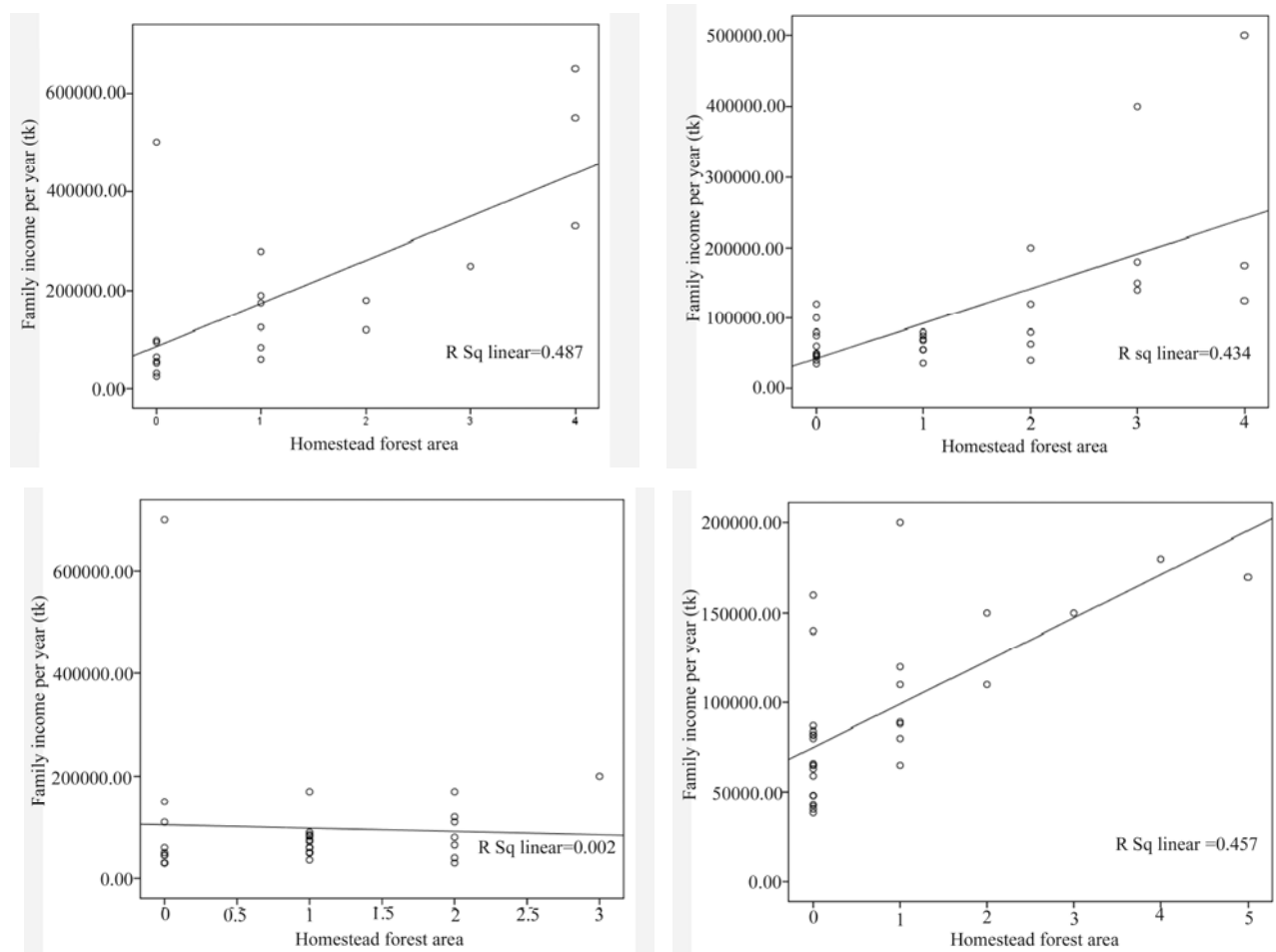


Fig. 3 Relationship between family income with homestead forest area in (a) Mymensingh Sadar, (b) Muktagacha, (c) Fulbaria and (d) Bhaluka

Role of Homestead forests in Bangladesh: People's opinion

The Homestead agro-forestry system is very important for the economy of Bangladesh. The many woody species grown in the homesteads provide a significant source of fuel-wood, fodder, building materials and other forms of wood. In the context of the prevailing shortage of fuel-wood and excessive deforestation in Bangladesh, this homestead agro-forestry system has the greatest potential to supply fuelwood and timber supply. According to the village forest inventory, the estimated stock of timber and fuel-wood in village forests in Bangladesh is about 54.7 million m³ (Singh 2000). Although homestead area is continually increasing in Bangladesh, the actual size of the homesteads is diminishing day by day due to overwhelming population growth.

Review of secondary information shows that although the size of the homestead forests (11.5%) is very small compared to State

forests (86.3%), homestead forests are much more productive than state forests of Bangladesh. Moreover, homestead forests play an important economic role in rural livelihood. Homestead forests supply 70% of timber, 90% of fuel-wood (Khaleque, 1987) and bamboo, while the rest of the resources come from the State forests (Singh 2000). Village forests supply approximately 48% of saw and veneer logs and 90% of bamboo (FAO 1982). Profit from homestead forests contribute to 15.9% of the household income and generate 51.4 man-days of employment per household per year, thereby playing an important role in the household economy of the rural poor (Rahman et al. 2006). Approximately 80% of the homesteads comprise of less than 0.16 ha and 17% of the households do not own homesteads.

To understand the people's perceptions about certain attributes of homestead forestry and their contributions, a qualitative evaluation was conducted based on the respondent's individual opinions. This evaluation helped to get an impression of whether the

people are aware of homestead forestry practices and their importance. Table 4 shows the degree of acknowledgment of home-

stead forest's role in the study area according to the respondents.

Table 4: Degree of acceptance of homestead forest's role

Parameter	Degree of acceptance			
	Mymensingh Sadar	Muktagacha	Fulbaria	Bhaluka
Homestead is a major source of vegetables	2	4	2	3
Homestead is a major source of fruits	3	4	3	4
Homestead is a major source of fuel-wood	2	5	2	5
Homestead is a major source of timber	3	4	3	3
Homestead is a major source of bamboo	2	5	5	4
Homestead is a major source of fish	2	4	3	4
Homestead is a major source of rural nutrition	2	3	2	3
Homestead is a major source of poultry and livestock	2	5	5	5
Homestead provides significant additional income	2	4	1	5

Here, 0= no acceptance, 1= minute acceptance, 2= slight acceptance, 3= moderate acceptance, 4= high acceptance, 5= extremely high acceptance

Source: Field survey

There was a very good response with regards to nine different aspects of homestead forests from the study sites, i.e. most of the people accepted homestead's contributions. However, the mean score against each of the nine questions was rather low in Mymensingh Sadar. The reason for the lower response in Mymensingh is attributed to the fact that the site is close to the urban area and people have access to alternative sources of income. Thus, they depend less on homestead forestry practice and are less aware of homestead forests' role and contributions. The fact that the people of Fulbaria are less economically dependant on homestead practices is reflected in their responses, and this is further supported by the regression analysis where the people of Fulbaria showed the lowest correlation between homestead forest and annual family income.

Conclusion

The current situation of forests and forest resources in Bangladesh is far below the desired level. Deforestation is continuing in forests all over the country, even in protected or reserved forests. Homestead forest development can be a good option to help preserve and restore the forests, because in homestead forestry practice, the owner of the homestead area is the sole caretaker and beneficiary of the forest. As many people in the study area and in Bangladesh have very small amounts of per capita land-holdings, all available land including homesteads should be brought under a crop production system, thus enhancing the homesteads both in terms of quality and quantity.

The economic contributions from homestead forest are indisputable as 3 out of 4 Upazilas have shown correlations of nearly 45% between their annual family income and homestead forest area. From this result it is concluded that although homestead forests are much smaller than State forests in Bangladesh, they have more potential than State forests from a product supply standpoint. Some productive species like Banana, Betel nut, Jackfruit etc. are abundant in homestead forests, which suggest

the importance of those species in terms of potential economic benefits. Most importantly, the people are in favor of continuing homestead forestry practice for various reasons, with no major exceptions. All of these reasons support the argument that homestead forestry practice is an effective way to achieve both economic and environmental wellbeing. As it has been observed that indigenous knowledge on homestead forestry practices is in the possession of local rural people, there is good opportunity for scientists to synthesize the available knowledge and develop scientific models to help improve the overall effectiveness of homestead forestry practices. The results of this study and future research on this topic could help policy makers formulate more effective policies at the local and national level, and could also be relevant and beneficial to other socially and environmental similar regions of the world.

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